



JAMES WEBB SPACE TELESCOPE

A CASE FOR SMALL BUSINESS



OFFICE OF **SMALL BUSINESS** PROGRAMS
...where small business makes a **BIG** difference



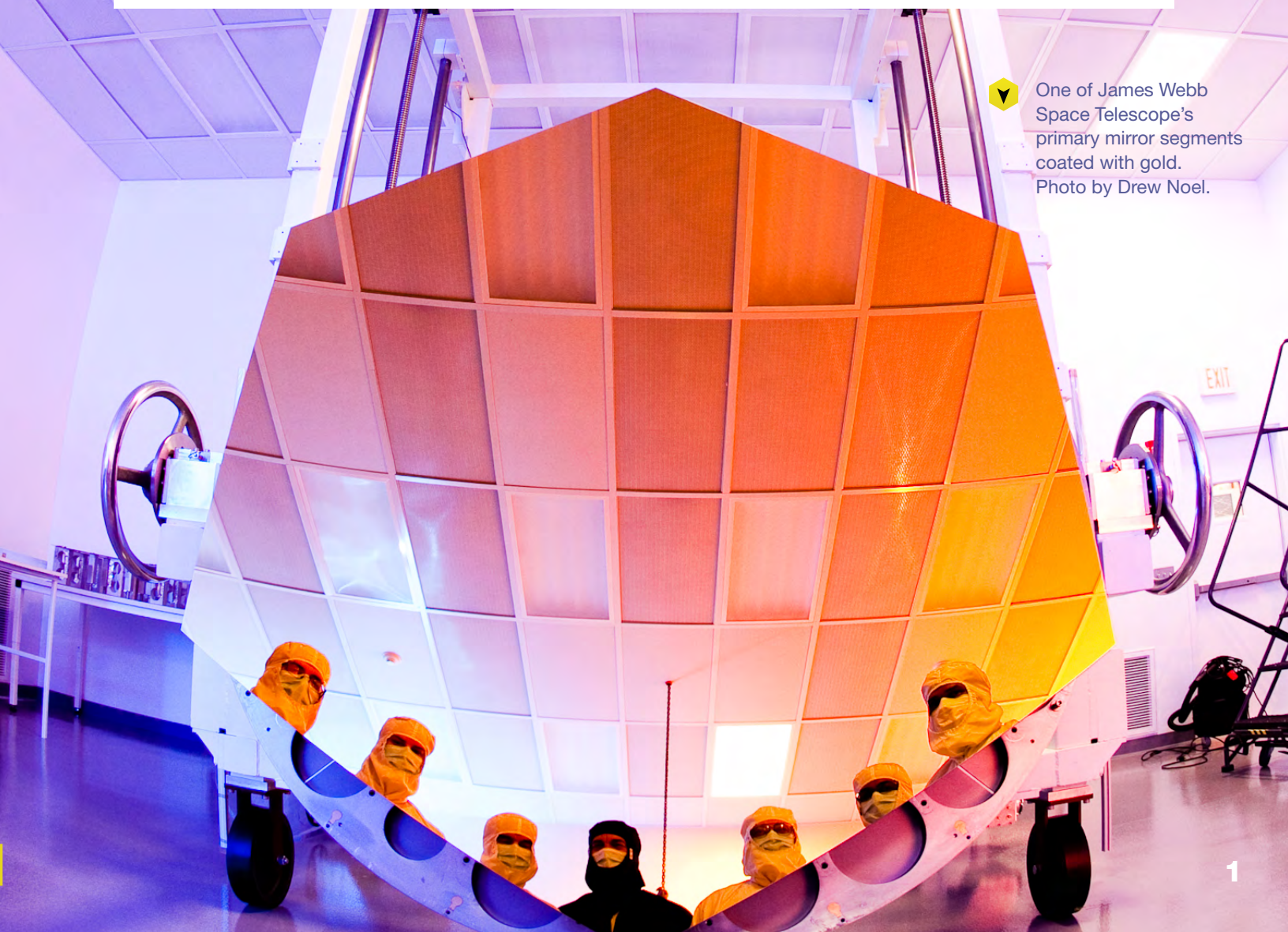
Ball Aerospace's Jake Lewis is reflected in one of the mirrors on a James Webb Space Telescope array that was in the X-Ray and Cryogenic Facility for testing.

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One of James Webb Space Telescope's primary mirror segments coated with gold. Photo by Drew Noel.



Office of Small Business Programs

Mission Statement

MISSION STATEMENT

The mission of the NASA Office of Small Business Programs is to promote and integrate small businesses into the industrial base of contractors and subcontractors that support the future of space exploration, scientific discovery, and aeronautics research.

**Over
85%**

of the small businesses
involved in the mission
work within the high
technology work
classification.



Inside a giant clean room at NASA's Goddard Space Flight Center in Greenbelt, Maryland, the pathfinder telescope, a practice section of the James Webb Space Telescope, stands fully assembled in 2014.

Message

from the NASA Office of Small Business Programs Associate Administrator



On behalf of the NASA Office of Small Business Programs (OSBP), I am pleased to announce the newest addition of the publication series “A Case for Small Business: James Webb Space Telescope (JWST)” which highlights the astounding accomplishments and extraordinary efforts of over

800 small businesses located across 43 states that have contributed to this mission. On Christmas morning, December 25, 2021, at 07:20 a.m. EST, myself, and millions of other people, were glued to our televisions, watching the highly anticipated launch of the JWST. We watched, in anticipation, as this instrument prepared to search for the first galaxies formed after the Big Bang, measure the physical and chemical properties of planetary systems, investigate the potential for life in those systems, and much more!

A great deal of these companies, introduced in this publication, have provided an array of products and services to support the program. A few of these parts include precision fasteners, engineering services, and the development of alloy products for Aerojet’s RS-25 rocket engines.

The featured small businesses are just a microcosm of the countless high-tech firms that enable NASA to complete its various missions. The majority of these businesses were able to perform under rigorous standards, and due to their success, witnessed substantial growth in revenue, personnel, and organizational capabilities.

We are delighted to showcase, that these companies are champions for fostering innovation, and are pioneers for the future of space exploration, scientific discovery, and aeronautics research! I want to thank these companies and other small businesses

that support NASA every day with these various capacities that enable the Agency to be successful. Without their dedication, NASA would not be able to accomplish its robust missions.

My team and I could not achieve success without backing from senior leadership. OSBP has significant support from the Agency’s Senior Management, the NASA Mission Directorates, acquisition personnel, and the mission support offices. I would like to specifically recognize NASA Administrator Bill Nelson, for his ongoing commitment to the program. In addition, I would also like to thank Ms. Pam Melroy; Deputy Administrator, Mr. Robert Cabana; Associate Administrator, the Office of Procurement, the Center Directors, and the Procurement Officers located at each of the Centers. In addition, special recognition goes to the Center Small Business Technical Advisors and Small Business Technical Coordinators who collaborate with the Small Business Specialists to interpret technical capabilities and assist them in identifying accomplished small businesses.

OSBP would not be as successful without the commitment of the Agency’s Small Business Specialists. Each day they have the rigorous assignment of ensuring small businesses are afforded the maximum practicable opportunities to participate in NASA’s prime contracts and subcontracts.

In closing, I hope these success stories empower additional small businesses, to learn that they can support NASA in its upcoming missions. As you can see from the companies included in this publication, NASA is an agency “Where Small Business Makes a Big Difference.”

A handwritten signature in dark ink, reading "Glenn A. Delgado".

Glenn A. Delgado
Associate Administrator
NASA Office of Small Business Programs

Veteran-Owned

small businesses

supported the mission by providing important pieces such as cables, harnesses for the pathfinder, and other various flight hardware needed for a successful launch.



The technicians who are inspecting the telescope and its expansive golden mirrors conduct a “lights out inspection” in the Spacecraft Systems Development and Integration Facility (SSDIF) at NASA’s Goddard Space Flight Center in Greenbelt, Maryland. The clean room lights were turned off to inspect the telescope after it experienced vibration and acoustic testing.

Message

from the JWST Project Manager



The James Webb Space Telescope (JWST) is the largest and most complex observatory ever launched by humans. With advanced detector technology, mirror development, 40 deployments, and a sun shield the size of a tennis court, the technological challenges for JWST were many.

Without well over 300 small businesses contributing, JWST would not be the success it is today. The small business partners of the JWST program contributed critical components to the mission including solid state recorders, solar cells, the satellite battery, and valves for thrusters.

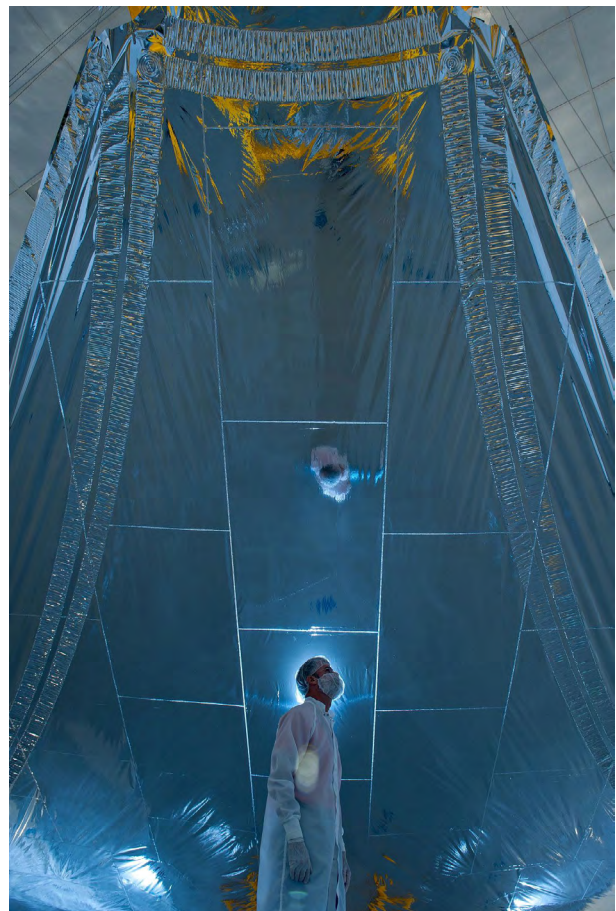
The fabrication of the JWST sunshield layers were contributed by a small business partner and without the sunshield JWST could not reach its operating temperature of less than 40 deg. K. Critical analyses to the success of JWST were provided by small businesses from airflow modeling to orbital analysis to mechanical dynamics. Machining of components, electrical harnesses, and composite technologies were all supported by small businesses. Even areas not directly linked to flight hardware such as videography and COVID supplies/services were provided by small businesses.

As NASA continues to move forward to more and more challenging missions in the future, the unique skill set brought forth by small businesses have become an important strategic and vital component to mission success.

Bill Ochs

Bill Ochs

James Webb Space Telescope Project Manager

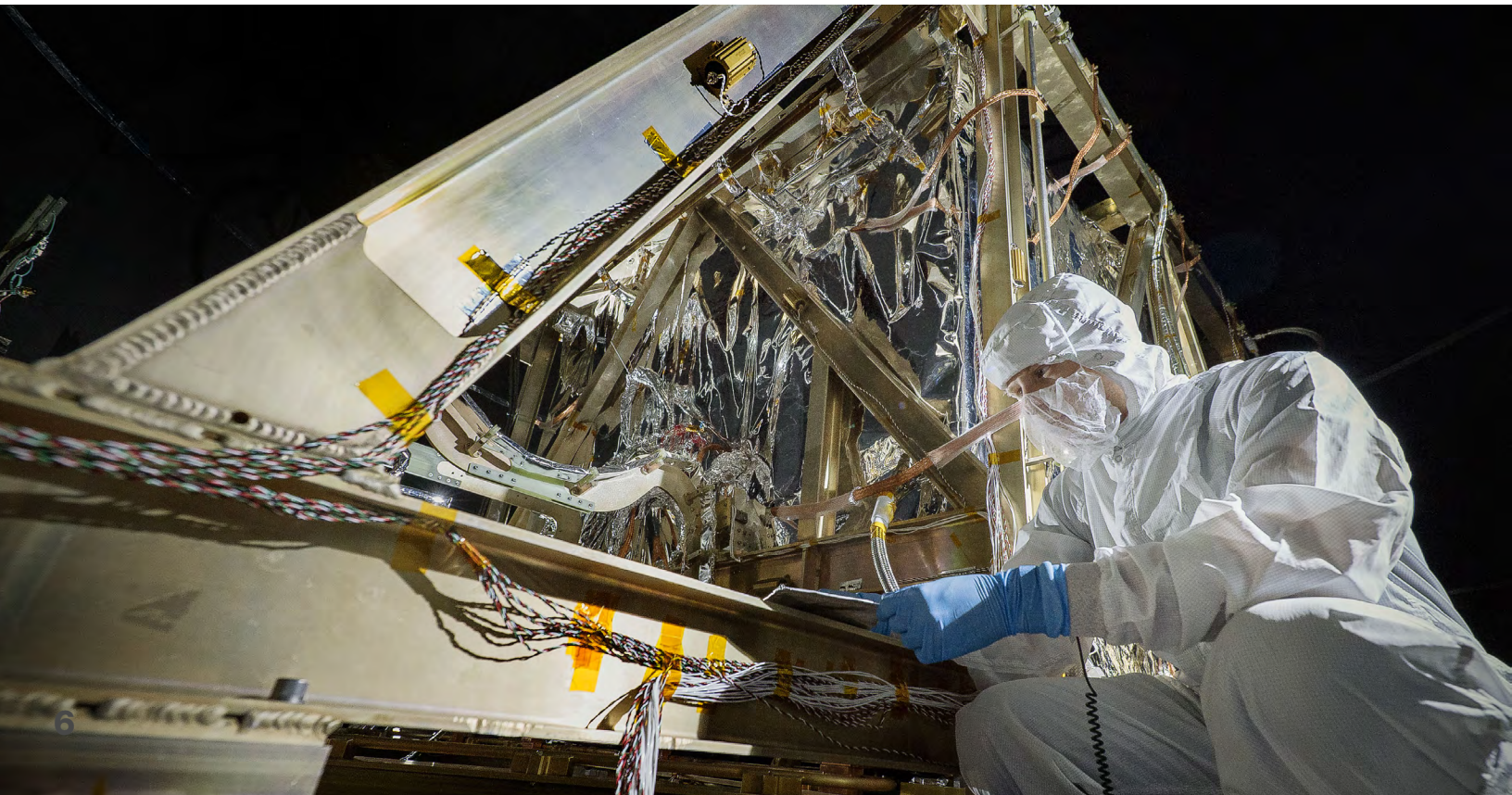


A full-scale JWST sunshield membrane is deployed at Mantech in Huntsville, Alabama. The JWST sunshield comprises five of these layers, each of which has to be precisely spaced with respect to the next.



▲ NASA engineers inspect a new piece of technology developed for the James Webb Space Telescope, the micro shutter array, with a low light test at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

▼ Engineer Alan Abeel conducts final inspections and places contamination foils before the start of a cryovac test on JWST instruments.





Two technicians stand before the primary mirror of the James Webb Space Telescope, consisting of 18 hexagonal mirrors. The telescope was mounted upright after a “center of curvature” test conducted at Goddard Space Flight Center.





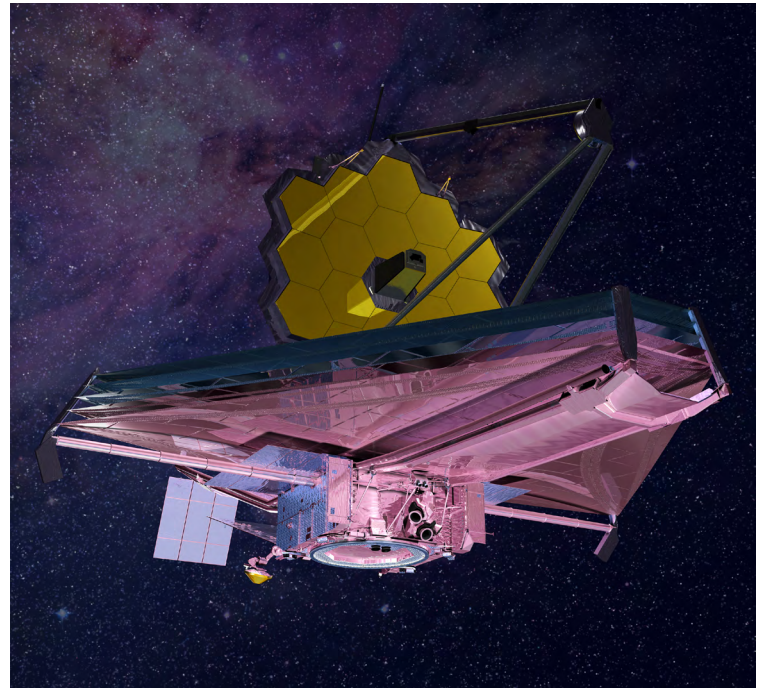
Engineer **Erin Wilson** adds aluminum tape to electrical cables to protect them from the cold during environmental testing of special optical equipment. These tests will verify the alignment of the actual flight instruments that will fly aboard NASA's James Webb Space Telescope.

About the **James Webb Space Telescope** Mission

The James Webb Space Telescope is an international collaboration between NASA and its partners, ESA (European Space Agency) and the Canadian Space Agency. Thousands of engineers and hundreds of scientists worked to make Webb a reality, along with over 300 universities, organizations, and companies from 29 U.S. states and 14 countries, including over 800 small businesses.

The James Webb Telescope (Webb) was launched on December 25, 2021 with the mission to allow for a closer look at the beginning of time and better understand our place in the universe like never before. Webb's highly technologically advanced infrared telescope will help explore every phase of cosmic history—from within our solar system to the most distant observable galaxies in the early universe.

Webb is NASA's largest and most advanced space telescope that will directly observe a part of space and time never seen before using its four science instruments: Near-Infrared Camera (NIRCam), Near-Infrared Spectrograph (NIRSpec), Mid-Infrared Instrument (MIRI), and Near-Infrared Imager and Slitless Spectrograph (NIRISS) with the Fine Guidance Sensor (FGS). With these instruments, Webb is designed to “see” deep into our galaxies with unprecedented resolution and sensitivity as well as observe exoplanets located in their stars' habitable zones, the regions where a planet could harbor liquid water on its surface and can determine if and where signatures of habitability may be present.



▲ Artist rendering of the James Webb Space Telescope

Small businesses
from
**Historically
Underutilized
Business Zones
(HUBZones)**
supported the

**Webb
mission**
by providing efforts
in precision machining,
manufacturing, and
distributing electronic
components and
assemblies.

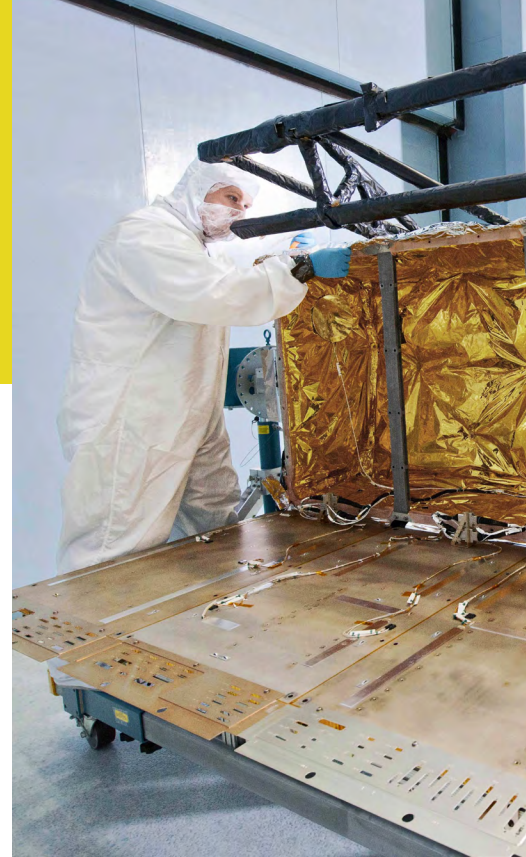
Top 10 Highlights of Small Business Participation

Over
480

Small Business
Subcontractors from 39
states supported the
JWST Mission.

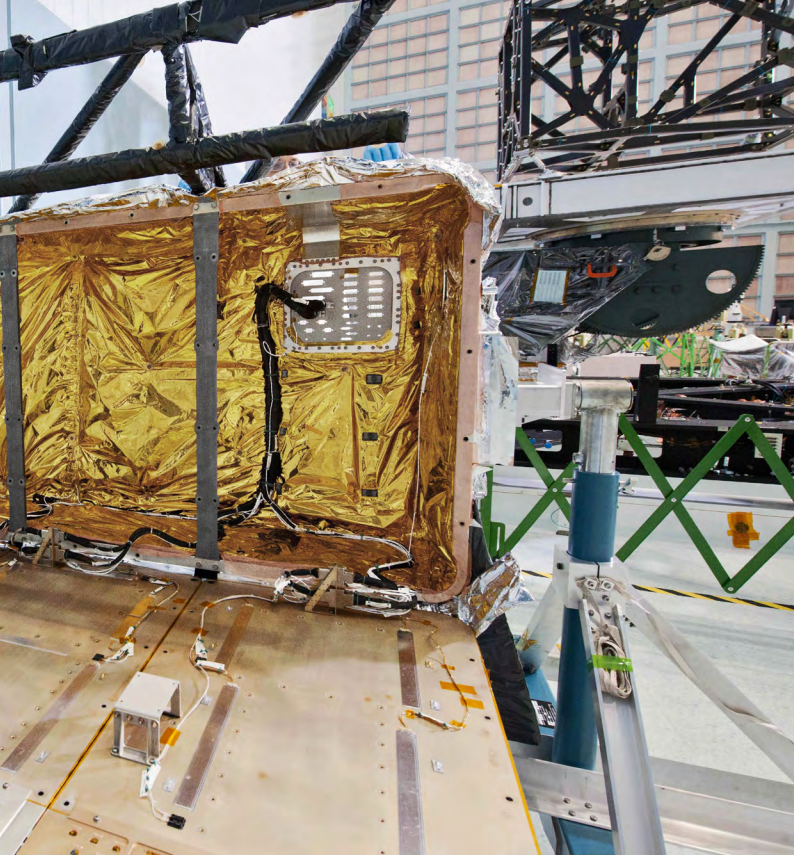
Total small
business
subcontracting dollars
exceeded

\$400
million.



Just like drivers sometimes use snow to clean their car mirrors in winter, two Exelis Inc. engineers are practicing “snow cleaning” on a test telescope mirror for the James Webb Space Telescope at NASA’s Goddard Space Flight Center in Greenbelt, Maryland.

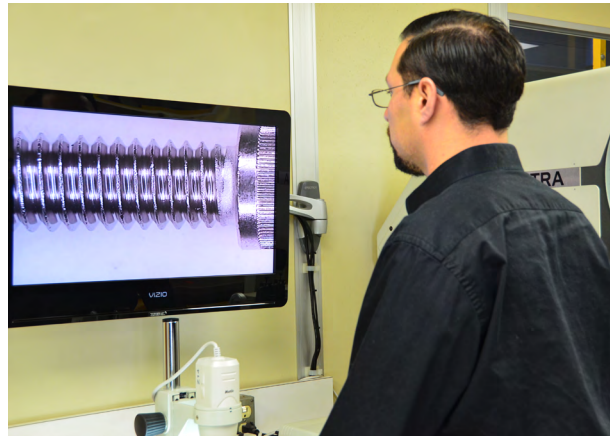
1. Provided the operational virtualized Front-End Processors (FEPs) to Raytheon, which manage the health and status links with JWST.
2. Provided a Translator Front-End-Processor (TFEP) which interfaces between the operational FEPs, and the Observatory Test Bed (OTB), which processes the communications link, and emulates the NASA network interfaces.
3. Development of a high-fidelity software only simulator used for ground system validation, mission operation training and mission simulations.
4. Development of Integrated Science Instrument Module (ISIM) flight software.
5. Managed production of the Optical Simulator (OSIM), designed and fabricated hardware for the Core II test, fabricated the thermal control system hardware for Chamber A, and provided numerous electrical support harnesses.
6. Provided cryogenic tip/tilt stages, control software and large cryogenic dewars for thermal testing.
7. Supplied high reliability Cernox resistance temperature sensors which are being utilized on all four JWST modules.
8. Provided vibration and shock testing for the Near Infrared Camera (NIRCam) program.



▲ This photo shows the James Webb Space Telescope's "IEC" all wrapped up in a thermal blanket, and looking like a holiday package at a cleanroom in NASA's Goddard Space Flight Center in Greenbelt, Maryland.



▶ 3 Fadal VMC 3016 machines by the Bob Lewis Machine Company.



▶ Technician from Jackson Aerospace performing quality assurance.

9. Designed and manufactured of electronic support equipment used during environmental testing of the JWST satellite system in Chamber A at the Johnson Space Center (JSC).
10. Developed & supported the Laboratory Virtual Instrument Engineering Workbench (LabVIEW) based application software for the following Ground Support Equipment (GSE).

Small Businesses

were the primary battery manufacturer for JWST.

Specifically,

6

Women-Owned

businesses supported the construction, design, and engineering of Webb.



▶ This is the James Webb Space Telescope ETU (engineering test unit) primary mirror segment returning to the cleanroom at NASA Goddard after undergoing some tests at our new Calibration, Integration, and Alignment Facility (CIAF).

Credit: NASA/Goddard/Chris Gunn



In 2014, the sunshield test unit of the James Webb Space Telescope was stacked and expanded at a cleanroom in the Northrop Grumman facility in Redondo Beach, California.

Primary

James Webb Space Telescope

Academic and Industry Partners

Northrop Grumman	Responsible for providing the Spacecraft, the Optical Telescope Element, portions of the Integrated Science Instrument Module, Observatory System integration and test, support to Observatory verification, Observatory commissioning, associated systems engineering, and the ground and launch support equipment. Click here for the resource.
Ball Aerospace	“Optical Mirror System Provider.” Designed and built the advanced optical technology and lightweight mirror system that will enable Webb to look 13.5 billion years back in time. Click here for the resource.
L3Harris Technologies	Integrated components made by various partners to form the Optical Telescope Element, which will collect light and provide sharp images of deep space. Click here for the resource.
Lockheed Martin	Built the Near Infrared Camera (NIRCam) which will be key in giving the telescope its first glimpse of celestial light. Click here for the resource.
Space Telescope Science Institute	<p>Maximized the science output of the mission by conducting the following:</p> <ul style="list-style-type: none">• Coordinated the selection of the scientific program• Managed the Webb science grants program• Provided user-friendly software for proposing and planning observations• Operated the observatory and its instruments• Provided software for analyzing and calibrating Webb’s data• Made Webb’s scientific data accessible to scientists around the world• Explained the ground-breaking science of Webb to a public audience <p>Click here for the resource.</p>
University of Arizona	Designed the Near Infrared Camera instrument, dubbed NIRCam, which incorporated innovative optical, mechanical, structural, thermal and electronic mechanisms. Click here for the resource.

Supporting Small Businesses at a Glance

Over
400

Small Businesses
contributed to the
JWST Mission.

At the time of offer, and throughout the manufacturing of the James Webb Space Telescope (JWST), Northrop Grumman diligently contracted with the Small Business Community.

1-SOURCE ELECTRONIC COMPONENTS INC
A & R TAPPAULINS INC
A AND A FABRICATION AND
A AND J INDUSTRIES INC
A AND R TAPPAULINS INC
AAA PLATING & INSPECTION INC
ABSOLUTE SCIENTIFIC PRODUCTS INC
AC AND A ENTERPRISES LLC
ACCEL CONNECTORS INC
ACCURATE ALLOYS INC
ACCURATUS CERAMIC CORP
ACCU-SEMBLY INC
ACOPAN TECHNICAL COMPANY
ADVANCED COATING TECHNOLOGY INC
ADVANCED INTEGRATION TECHNOLOGY LP
ADVANCED MACHINING AND TOOLING INC
ADVANCED STRUCTURAL TECHNOLOGIES, I
ADVANCED TEST EQUIPMENT CORP
AEM HOLDINGS INC
AERO ENGINEERING INC
Aerofit LLC
AEROFLEX
AEROPACKAGING, INC.
AF MACHINE AND TOOL CO INC
AFM INDUSTRIES INC
AI TECHNOLOGY, INC.
AIRCRAFT FASTENERS INC
ALIGN PRECISION – Cedar City, LLC
ALL ABOUT WYRE
ALLAN AIRCRAFT SUPPLY COMPANY LLC
ALLIANCE SPACESYSTEMS LLC
ALTEMP ALLOYS, INC.
ALVATEK ELECTRONICS LLC
AMERASIA INTERNATIONAL TECHNOLOGY
AMERICAN CLEANSTAT
AMERICAN DURAFILM CO INC
AMERICAN PRECISION PROTOTYPING LLC
AMERICAN PRODUCT DISTRIBUTORS INC
AMETEK INC dba
AMRO FABRICATING CORPORATION
ANACAPA MICRO PRODUCTS INC
ANACHEM LABORATORIES LLC
ANADITE CA RESTORATION TRUST
ANALYTICAL SOLUTIONS INC
ANALYTICAL SOLUTIONS INC
ANDREW L COHEN
ANTRIN MINIATURE SPECIALTY
APPLIED FIBER MANUFACTURING LLC
APPLIED PRODUCTS CO
APR CONSULTING INC
APTEK LABORATORIES, INC.
APV MANUFACTURING AND
AREA 51 ESG INC
AREMAC HEAT TREATING LLC
ARROW ELECTRONICS INC
ARTISAN SCIENTIFIC CORP
ASTRO ALUMINUM TREATING CO INC
ASTRO PAK CORP
ASTRO-TEK INDUSTRIES LLC
ATA ENGINEERING INC
A-THRONE CO INC
AVNET INC

AVTEC SYSTEMS INC
AVTECH SOFTWARE INC
AVX CORPORATION
AXIOM ELECTRONICS LLC
B AND B ELECTRONICS MFG CO
BADS LTD
BAILEY SPECIALTY CRANES
BARRY AVENUE PLATING CO INC
BASSLER ENTERPRISES
BAUGHN ENGINEERING INC
BAYCHEM INC
BEARING ENGINEERS INC
BESTEK MACHINE COMPANY
BETA TRANSFORMER TECH. CORP.
BETTER WAY GRINDING INC
BISCO INDUSTRIES INC
BJG ELECTRONICS INC
BLACK KNIGHT ENTERPRISES, LLC
Black Oxide Industries, Inc.
BLAKE WIRE & CABLE CORP
BOB LEWIS MACHINE CO INC
BOND OPTICS LLC
BRUNSON INSTRUMENT CO
C & J ENGRAVERS
CALIFORNIA FINE WIRE CO
CALIFORNIA LASERS
CALIFORNIA METAL PROCESSING CO
CANYON COMPOSITES INC
CARLTON FORGE WORKS
CARR LANE MFG
CASTER TECHNOLOGY CORPORATION
CB MANUFACTURING & ENGINEERING INC
CEDTECH INC
CENTRAL CA FLUID SYSTEM TECH
CENTRAL CALIFORNIA FLUID SYSTEM
CENTURY SPRING CORPORATION
CERTIFIED METAL CRAFT INC
CERTIFIED STEEL TREATING CORP
CHEMICAL STRATEGIES INC
CHIP SUPPLY INC
CHIPTON ROSS STAFFING INC - GRI
CHIPTON-ROSS INC
CICOIL LLC
CICON ENGINEERING INC
CIRTECH INC
CLAD METAL SPECIALTIES INC
CLAYBORN LABS
CLAYTON CONTROLS
CLEAN ROOMS WEST INC
CLEARPLAN LLC
CLICK BOND INC
CLIO INC BB HEMPHILL SPRINGS
COAST ACM
COAST AEROSPACE MANUFACTURING INC.
COAST AEROSPACE MFG INC
COAST MACHINERY MOVERS
COASTLINE METAL FINISHING CORP
COLBRIT MANUFACTURING INC
COMPOSITE TECHNOLOGY DEVELOP INC
COMPUCAFT INDUSTRIES INC
COMPUTER PROTECTION TECHNOLOGY, INC
CONTROLLED MOTION SOLUTIONS INC

COONER WIRE COMPANY
COORDINATED EQUIPMENT CO
COORDINATED WIRE ROPE AND RIGGING
CORE SYSTEMS INC
CORLAND CO
CORLAND COMPANY
CORPORATE COMPUTER CENTERS INC
CRAIG PACKAGING PRODUCTS
CRATER INDUSTRIES LLC
CRYSTALTEK CORPORATION
CYBERRESEARCH INC
CYNERGY PROFESSIONAL SYSTEMS LLC
CYTEC INDUSTRIAL MATERIALS
DATA SPECTRUM INC
DEL MAR AVIONICS LLC
DELTABAHN LLC
DILLON QUALITY PLUS INC
DIVERSIFIED CRATING
DIVERSIFIED TESTING INC
DOUGLAS ELECTRICAL COMPONENTS
DPA COMPONENTS INTL
DPA LABS INC DBA
DUNMORE CORPORATION
DYNAMIC SOLUTIONS USA
DYTRAN INSTRUMENTS INC
E I COMPUTER SYSTEMS INC
EAST COAST ELECTRONICS & DATA
EFD, INC.
ELCON PRECISION LLC
ELECTRO ENTERPRISES INC.
ELECTROMATIC EQUIPMENT CO INC
ELECTROMATIC INC
ELECTRON BEAM WELDING LLC
ELECTROSPEC INC
ELEMENT MATERIALS TECHNOLOGY
ELITE METAL FINISHING LLC
ELMA ELECTRONICS INCORPORATED
EMBEDDED TECHNOLOGIES INC
EME INC
EMPOWERMENT PARTNERS LLC
Ensign-Bickford Aerospace & Defense
ENTERPRISE RESOURCE SERVICES INC
ENTERPRISE RESOURCE SVCS INC-GRI
ENVIRONMENT ASSOCIATES INC
EPNER TECHNOLOGY INC
EXCALIBUR ENGINEERING INC
EXPANDED RUBBER & PLASTIC CORP
EXPEDITE SHIMS & STAMPING INC
EXTREME ENGINEERING SOLUTIONS INC
FAIRVIEW MICROWAVE INC
FALMAT, INC.
FARO TECHNOLOGIES INC
FASTENER SPECIALTY
FCP GENERAL CONTRACTING INC
FCP INC
FERGUSON CONDUCTORS INC
FLEXLINE LLC
FLIGHT MICROWAVE CORP
FLOTTRON INC
FOLSOM TOOL CORP
FORWARD COMPONENTS INC
FURNO CO

FUTURE TECH ENTERPRISE INC
G AND N RUBICON GEAR INC
GAVISH INC
GC MICRO CORP
GEIGER PLASTICS INC
GEODETIC SERVICES INC
GEOLOGICS CORPORATION
GEORGE B WOODCOCK AND CO
GLOBAL COMP SOUTHEAST INC.
GOENGINEER INC.
GRAPHIC RESEARCH INC.
GUY BROWN LLC
HANSEN'S WELDING INC
HARCOURT INDUSTRIAL INC
HARMONIC DRIVE LLC
HASALA ENGINEERING INC
HC PACIFIC
HELIUM LEAK TESTING INC
HI-REL LABORATORIES
HIXSON METAL FINISHING
HOUSTON PRECISION FASTENERS 1LP
HSI SENSING INC DBA HERMETIC
HUGHES CIRCUITS INC
HUGO ENGINEERING CO INC
HURLEN CORPORATION
ILCO TUBE BENDING INC DBA ILCO
IMPRES TECHNOLOGY SOLUTIONS INC
INDIUM CORP OF AMERICA
INDUSTRIAL CASTER & WHEEL CO
INDUSTRIAL SUPPLY COMPANY INC
INFINITE ELECTRONICS INTL INC
INGENICOMM INC
INGENICOMM, LLC.
INLAND EMPIRE COMPONENTS INC
INSTRUMENTED SENSOR TECHNOLOGY
INSULATION SUPPLY CO
INTEC PRODUCTS INC
INTEGRATED PROCUREMENT
TECHNOLOGIES
INTERFACE INCORPORATED
INTERFACE WELDING
ION CORPORATION
ISO GROUP INC
IT1 SOURCE LLC
J A WOOLLAM CO INC
JACKSON AEROSPACE INC
JACKSON AND TULL CHARTERED
JAG PROFESSIONAL SERVICES-GRI
JB TECHNICAL SUPPORT SERVICE LLC
JFW INDUSTRIES INC
Jonathan Engineered Solutions
JPM OF MISSISSIPPI INC
K & M PRECISION MACHINING INC
KMAK Consulting Inc
KR ANDERSON INC
KRAYDEN INC
KURT J LESKER
LAKE SHORE CRYOTRONICS INC
LAMINATED SHIM COMPANY INC
LANGE PRECISION INC
LANSMONT CORPORATION
L-COM INC

Supporting Small Businesses at a Glance

LEE SPRING COMPANY
LENTROS ENGINEERING INC
L'GARDE INC
LINEAR INDUSTRIES LTD
LORD & SONS INC
LORDON ENGINEERING
LUBECO ANODICS INC
LUBECO INC
LYNCO GRINDING CO INC
MACHINE TEK LLC
MAGNET SALES AND MFG CO INC
MARLIN MANUFACTURING CORP
MARTINEZ AND TUREK INC
MARWAY POWER SOLUTIONS INC
MARWAY POWER SYSTEMS INC.
MAURY MICROWAVE CORP
MAXWELL TECHNOLOGIES INC
MBO PARTNERS INC - GRI
MCMASTER CARR SUPPLY CO
MDC VACUUM PRODUCTS LLC
MEADOWGATE TECHNOLOGIES LLC
MEDIA RECOVERY-SHOCKWATCH
MEGAPHASE LLC
Metal Surfaces Inc.
METALCRAFT TECHNOLOGIES INC
MICROAGE
MICRO-COAX INC
MICRO-MODE PRODUCTS INC
MICROPAC INDUSTRIES INC
MIL TECH ELECTRONICS INC
MILESTEK CORP
MILESTEK INC
MILL-MAX MFG. CORP.
MILLWORX PRECISION MACHINING INC
MINI-SYSTEMS INC
MKS INSTRUMENTS INC
MOELLER MANUFACTURING AND
MOTION INDUSTRIES INC
MOUSER ELECTRONICS
MS INSERTS & FASTENERS CORP
MU-DEL ELECTRONICS INC
MU-DEL ELECTRONICS LLC
MWS PRECISION WIRE INDUSTRIES, INC
NATES INDUSTRIAL TOOLS INC
NATIONAL AEROSPACE SUPPLY CO
NATIONAL INSTRUMENTS CORP
NB INDUSTRIES INC
NC DYNAMICS INC
ND INDUSTRIES INC
NEA ELECTRONICS INC
NELSON MANUFACTURING CO
NEXOLVE CORPORATION
NIKON METROLOGY INC
NOBLE MACHINE CO INC
NORTH ATLANTIC INDUSTRIES, INC.
NORTH HILLS SIGNAL PROCESSING CORP
NTS TECHNICAL SYSTEMS
NUMATIC ENGINEERING INC
NYLOK FASTENERS
OMEGA ENGINEERING INC
OMNETICS CONNECTOR CORPORATION
OMNI METAL FINISHING INC.

ORANGE COUNTY NAME PLATE CO
ORCON CORPORATION
Oscar's C/T Service
PACIFIC COMBUSTION
PACIFIC INSTRUMENTS INC
PACIFIC TESTING LABORATORIES
PARK AEROSPACE CORP
Pasternack Enterprises Inc
PB AND J PARTNERS LLC
PCPC DIRECT LTD
PEGASUS CLEANROOM SERVICES
PEI - GENESIS
PEIZEN INC
PENN ENGINEERING COMPONENTS
PENWAL INDUSTRIES INC
PGS WORLDWIDE LLC - GRI
PHILLIPS MACHINE AND WELDING CO INC
PICKERING INTERFACES INC
PIONEER CIRCUITS INC
PLASCO CORP
PLAYA TOOL AND MARINE INC
POWELL ELECTRONICS INC
PRECISION AEROSPACE CORPORATION
PRECISION ELECTRONIC COIL
PRECISION MEASUREMENTS AND
PRESIDIO COMPONENTS INC
PRIME RESOURCE INC
PRIORITY METALS INC
PROCESS FAB INC
PROGRESSIVE TOOL AND DIE INC
PROTECTIVE PACKAGING CORP
PULSAR MICROWAVE CORP
PULSE RESEARCH LAB
Q-TECH CORP
QUALITY HEAT TREATING INC
QUALITY MATERIALS INSPECTION
QUARTUS ENGINEERING INC
QUEST COMPONENTS INC
QUINSTAR TECHNOLOGY, INC
QUINTRON SYSTEMS INC
R M HADLEY CO INC
R S HUGHES
RACAAR CIRCUIT INDUSTRIES INC
RACKMOUNT SOLUTIONS LTD
RAH INDUSTRIES INC
RAINBOW RUBBER EXTRUSIONS INC
RAMALLO TOOL AND DIE CO
RC & JT INC
Real Time Logic Inc
RED LION CONTROLS INC
REID PRODUCTS INC
RESEARCH METAL INDUSTRIES INC
RFMW LTD
ROBERTS PRECISION ENGINEERING INC
ROCHESTER ELECTRONICS INC.
ROCK WEST COMPOSITES
ROMAKK ENGINEERING
RONCELLI PLASTICS INC
ROSS NAME PLATE CO
RSM ELECTRON POWER DBA
RUGGED SYSTEMS INC
SAGINAW PRODUCTS dba CIGNYS

SANTA FE ENTERPRISES INC
SCALE MODEL CO
SCARROTT METALLURGICAL CORP
SCIENCE APPLICATIONS INTERNATIONAL
SEAKR ENGINEERING INC
SEILER HUGHES
SELECT FABRICATORS INC
SELLER'S OPTICAL INC
SEMCO
SENSING SYSTEMS CORPORATION
SERAPID INC
SHOCKWATCH INC
SHRINK WRAP PROS LLC
SIGMADYNE INC
SILVER ENGINEERING INC
SMALLEY STEEL RING COMPANY
SN PRECISION ENTERPRISES INC
SO. CALIFORNIA CONNECTOR CO.
SOLDERMASK INC
SOUTHLAND TECHNOLOGY INC
SOUTHWESTERN BAG COMPANY
SPACECRAFT COMPONENTS CORP
SPECIALTY FABRICATIONS INCORPORATED
SPS TECHNOLOGIES LLC
SRI CONNECTOR GAGE COMPANY
Stahlville Tools NA Inc
STATE OF THE ART INC
STEEL SERVICES CO
STERLING COMPUTERS CORP
STEVEN ENGINEERING
STRAINERT COMPANY
STRAND PRODUCTS INC
SUNRISE TECHNOLOGIES INC
SUNSTONE CIRCUITS LLC
SUPERBOLT INC
SWISS DEVCO
SYNERGENT SOLUTIONS INC-GRI
SYSTEMS CABLE PRODUCTS
T AND G SCIENTIFIC GLASS
TABER ACQUISITION CORP
TANDEX TEST LABS INC
TAPES PLUS INC
TASC TECHNICAL SERVICES LLC
TAVIS CORPORATION
TAYCO ENGINEERING INC
TCJ INC
TE WIRE & CABLE LLC
TECHMAR CORP DBA TECHMAR
ENCLOSURES
Technical Marketing Res.
TECHNI-TOOL INC
TECHNOLOGY TRADING CO
TECHNOVARE SYSTEMS INC
TECHTRADING
TELEDYNE RELAYS A BUSINESS UNIT OF
TERRY KASPRZAK CORP
TESTEQUITY LLC
TEVET LLC
TEXAS ALMET LP
THE CARPENTER GROUP
THE MAVEN GROUP LLC
Thern, Inc.

THIESSEN MACHINE CORPORATION
THINKY USA INC
THOMPSON GUN DRILLING INC
THOR LABS INC
TIMBERCON
TIMKEN AURORA BEARING COMPANY
TODIZE CO INC
TOTAL STRUCTURES
TOUCHSTONE RESEARCH LABORATORY
TQ SYSTEMS INC
TRI METAL FABRICATORS, INC.
TRI MODELS INC
TRIDENT PLATING INC
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NASA Small Business Program Contacts



Ames Research Center (ARC)/
Armstrong Flight Research Center (AFRC)
Christine L. Munroe
Small Business Specialist
Tel: 650-604-4695
Fax: 650-604-0912
arc-smallbusiness@mail.nasa.gov
afrc-small-business-office@mail.nasa.gov



NASA Headquarters (HQ)
Glenn A. Delgado
Associate Administrator
Tel: 202-358-2088
Fax: 202-358-3261
smallbusiness@nasa.gov



Glenn Research Center (GRC)
Eunice J. Adams-Sipp
Small Business Specialist
Tel: 216-433-6644
Fax: 216-433-2480
grc-smallbusiness@mail.nasa.gov



NASA Headquarters (HQ)
Richard L. Mann
Program Manager
Tel: 202-358-2088
Fax: 202-358-3261
smallbusiness@nasa.gov



Goddard Space Flight Center (GSFC)
and Headquarters Acquisition Branch
Jennifer D. Perez
Small Business Specialist
Tel: 301-286-4379
Fax: 301-286-2666
gsfc-smallbusiness@mail.nasa.gov



NASA Headquarters (HQ)
Charles T. Williams
Program Manager
Tel: 202-358-2088
Fax: 202-358-3261
smallbusiness@nasa.gov



Goddard Space Flight Center (GSFC)
and Headquarters Acquisition Branch
Sholainka O. Martyn
Small Business Specialist
Tel: 301-286-4679
Fax: 301-286-2666
gsfc-smallbusiness@mail.nasa.gov



NASA Headquarters (HQ)
Robert Medina
Program Manager
Tel: 202-358-2088
Fax: 202-358-3261
smallbusiness@nasa.gov



Goddard Space Flight Center (GSFC)
and Headquarters Acquisition Branch
Kandace P. Chappell
Small Business Specialist
Tel: 301-286-8136
Fax: 301-286-2666
gsfc-smallbusiness@mail.nasa.gov



NASA Headquarters (HQ)
Truphelia M. Parker
Program Specialist
Tel: 202-358-2088
Fax: 202-358-3261
smallbusiness@nasa.gov



Goddard Space Flight Center (GSFC)
and Headquarters Acquisition Branch
Djaataa Onanuga
Small Business Specialist
Tel: 301-286-9083
Fax: 301-286-2666
gsfc-smallbusiness@mail.nasa.gov



NASA Headquarters (HQ)
Naeemah A. Lee
Program Specialist
Tel: 202-358-2088
Fax: 202-358-3261
smallbusiness@nasa.gov



Jet Propulsion Laboratory (JPL)
Dr. Charles E. Bray, Jr.
Manager
Tel: 818-354-5620
Fax: 818-354-4152
smallbusiness.programsoffice@jpl.nasa.gov



Jet Propulsion Laboratory (JPL)
Mary Helen Ruiz
 Small Business Administrator
 Tel: 818-354-7532
 Fax: 818-393-1746
smallbusiness.programsoffice@jpl.nasa.gov



Kennedy Space Center (KSC)
Joyce C. McDowell
 Small Business Specialist
 Tel: 321-867-3437
 Fax: 321-867-7999
ksc-smallbusiness@mail.nasa.gov



Jet Propulsion Laboratory (JPL)
Matthew B. Christian
 Small Business Administrator
 Tel: 818-354-2760
 Fax: 818-393-1746
smallbusiness.programsoffice@jpl.nasa.gov



Kennedy Space Center (KSC)
Natalie B. Colvin
 Small Business Specialist
 Tel: 321-867-4773
 Fax: 321-867-7999
ksc-smallbusiness@mail.nasa.gov



Jet Propulsion Laboratory (JPL)
Tara A. Every
 Small Business Administrator
 Tel: 818-354-1741
 Fax: 818-393-1746
smallbusiness.programsoffice@jpl.nasa.gov



NASA IT Procurement Office (ITPO)/
 Langley Research Center (LaRC)
Robert O. Betts
 Small Business Specialist
 Tel: 757-864-6074
 Fax: 757-864-8541
larc-smallbusiness@mail.nasa.gov



Jet Propulsion Laboratory (JPL)
Anmari Pagtalunan
 Small Business Administrator
 Tel: 646-720-7736
 Fax: 818-393-1746
smallbusiness.programsoffice@jpl.nasa.gov



Marshall Space Flight Center (MSFC)
David E. Brock
 Small Business Specialist
 Tel: 256-544-0267
 Fax: 256-544-4400
msfc-smallbusiness@mail.nasa.gov



Johnson Space Center (JSC)
Robert E. Watts
 Senior Small Business Specialist
 Tel: 281-244-5811
 Fax: 281-483-4326
jsc-smallbusiness@mail.nasa.gov



NASA Shared Services Center (NSSC)
Troy E. Miller
 Small Business Specialist
 Tel: 228-813-6558
 Fax: 228-813-6434
nssc-smallbusiness@mail.nasa.gov



Johnson Space Center (JSC)
Monica F. Craft
 Small Business Specialist
 Tel: 281-483-4134
 Fax: 281-483-4326
jsc-smallbusiness@mail.nasa.gov



Stennis Space Center (SSC)
Kay S. Doane
 Small Business Specialist
 Tel: 228-688-1720
 Fax: 228-688-6024
ssc-smallbusiness@mail.nasa.gov



Johnson Space Center (JSC)
Tumarrow Romain
 Small Business Specialist
 Tel: 281-483-2824
 Fax: 281-483-4326
jsc-smallbusiness@mail.nasa.gov



A Ball Aerospace technician stands within a James Webb Space Telescope array that was in the x-ray and cryogenic facility for testing.



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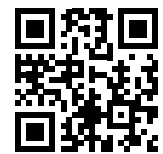
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